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MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

DECADE I.-VI

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

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1849.

N O T I C E.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all

classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the maps and memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

Geological Survey Office,
24th May, 1849.

BRITISH FOSSILS.

DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadae* and *Echinidae*.

With the exception of the *Crinoidea* and *Cystidea*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadae," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidae* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

BRITISH FOSSILS.

DECADE I. PLATE X.

NUCLEOLITES (CATOPYGUS) CARINATUS.

[Genus NUCLEOLITES. LAMARCK. (Sub-kingdom Radiata. Class Echinodermata. Order Echinidæ. Family Clypeasteridæ.) Body orbicular, oval, or cordate, more or less tumid, sometimes much depressed; ambulacra dorsally petaloid; anus supra-marginal; mouth sub-central.]

[Sub-genus *Catopygus*. Outline narrowing anteriorly; body truncated posteriorly, with the anus on the superior surface of the truncation. Tubercles around mouth conspicuous.]

SYNONYMS. *Nucleolites carinatus*, GOLDFUSS, Pet. Germ., p. 142, pl. 43, f. 4, *a-c*. *Catopygus carinatus*, AGASSIZ, Cat. Syst., p. 4. AGASSIZ and DESOR, Cat. Rais. des Echin., Ann. Sc. Nat., 3rd ser., vol. vii., p. 157. BRONN, Lethæa Geog., p. 613; Index Paleont., p. 249. MORRIS, Cat., p. 49.

DIAGNOSIS. *N. (Catopygus) ambitu ovali seu subrotundo, postice plus minusve dilatato; dorso convexo, prope anum obsolete carinato; apice eccentrico, vertice post apicem; ambulacris lineari-lanceolatis; extremitate anali truncata supra anum prominente, subapiculata, ano suboblongo in parte superiori posito; ventre convexiusculo.*

VAR. *α. ovato-rotunda, dorso tumido.*—*Nucleolites carinatus*, GOLDFUSS, Pet. Germ., pl. 43, f. 4, *a-c*.

VAR. *β. ovata, dorso antice declivente.*—*Nucleolites columbarius*, D'AR-
CHIAU, Mem. Geol. Soc. France, 2nd ser., vol. ii., pl. 13, fig. 3, *a, b, c*?

VAR. *γ. oblonga.*

VAR. *δ. subglobosa.*

The clear and distinct history of this fossil urchin dates from the excellent figure and description given by Goldfuss in the *Petrefacta Germanica*, where the *Nucleolites columbaria* of Lamarck is cited as a questionable synonym, and the *Echinites pyriformis* of Parkinson referred to without mark of doubt. Parkinson's species (Organic Remains, v. iii. pl. 3, f. 6), however, was from the Maestricht beds, and was rightly identified by him with the *Echinites pyriformis* of Leske (t. 44, f. 7 and 51, f. 5, 6), which circumstance seems to have escaped Goldfuss, who quotes the figures in Leske for his *Nucleolites pyriformis* (Pet. Germ., p. 141, t. 43, f. 7, *a-f*.) A comparison of specimens of the Maestricht fossils with ours has confirmed their distinctness; the anus in the

former, as indeed it is represented by both Leske and Parkinson, being much nearer the posterior margin, and the ambulacra much narrower than in *N. carinatus*. The *Nucleolites columbaria* of Lamarck was a species very insufficiently described by that author, who cites no figure, and mentions that it is found as fossil in the environs of Mons. In Count D'Archiac's valuable report on the fossils of the Tourtia, a remarkable cretaceous conglomerate found in Hainault and a part of French Flanders, a detailed and most excellent description is given of the *Nucleolites columbarius* of Lamarck, which is there distinguished from the *Nucleolites carinatus* of Goldfuss, from which it is stated to differ in its general form being more elongated, more depressed, and consequently less globular. Excellent figures are at the same time given, which, however, so closely resemble one of the commonest forms of our English *carinatus*, and certainly one not distinct, that I do not venture to separate the species; nor does the accompanying description contradict their identification. One point only in the figure seems to differ; the upper margin of the anus is not so prominent in the French specimens as in ours. M. Desmoulins is quoted by M. D'Archiac as having identified the species of Goldfuss with that of Lamarck. In the "Catalogue Raisonné des Echinides," the *Catopygus carinatus* is regarded as distinct from the *C. columbarius*, and the figure of D'Archiac is cited for the latter. Under the synonyms of the former, the name "*Nucleolites britanna*, Defrance," is cited, and as a variety, "minor: *Nucleolites ovulum*, Defrance." *Nucleolites* (*Catopygus*) *carinatus* was first enumerated as a British species by Morris in the "Catalogue of British Fossils." In the "Index Palæontologicus," Bronn cites *N. columbaria*, Lamarck, as a questionable synonym of *carinatus*, retaining at the same time *Catopygus columbarius* of Agassiz, for which he refers to D'Archiac's figure and description as a distinct species. In England, so far as I have seen at least, we have only the one species of this section of *Nucleolites*, and that one so variable in its outline that we are naturally led to suppose too many species have been made out of it on the Continent.

Description.—Outline varying from ovate to subrotund, always more or less widening out posteriorly, least so in vars. γ and δ . Back tumid, varying in degree of elevation; in some specimens, especially of var. β , subdepressed and declining anteriorly, in others subconic and much elevated in the centre, when the true apex is almost at the same spot with the highest point; the latter is usually, however, behind the ovarian disk. The apex is always more inclined to the front than to the posterior extremity. The sides, in all the varieties among British examples, are rounded with a very slight degree of compression in all varieties. The posterior extremity is truncated more or less abruptly. A more or less

developed obtuse carination runs down the posterior ambulacral space, with a curvature to a culminating point forming the superior margin of the anus, and part of a prominent, and in some specimens apiculated, arch over that aperture. The anus itself is vertically oval; it varies in size in different specimens, but is always small in proportion to the body; it occupies the upper portion of an obsolete and obscure groove, which vanishes as it approaches the posterior margin. The anus is always nearer the posterior margin than the apex. The ambulacra are narrowly lanceolate and faintly petaloid; they preserve the same proportions in all the varieties. They are nearly equidistant from each other at their summits. The number of pairs of pores in each row is nearly equal in all, and varies from 28 to 30 in well-grown specimens. The outer pores in each pair are elongated and oblique, and the two pores are connected by a groove more or less distinct in different examples. The ridges separating the grooves are rounded and smooth. The ambulacral plates between the rows of pores are narrow, small, and very numerous, but become much larger and broader suddenly, as the ambulacra vanish. Each of these broader ambulacral plates has a pair of minute pores, seeming to the eye as single, at its inferior and exterior angle. The interambulacral plates are ample and oblong. Both sets of plates are covered by minute moniliform tubercles, interspersed with still smaller granules, and only to be distinctly seen in exceedingly well-preserved specimens. There are four perforated ovarian plates, and five oculars, with very distinct eye-pores. The two anterior pairs of ovarian pores are placed nearer together than the two posterior ones, in consequence of the anterior ambulacrum, which is narrower than the others, only separating the former, whereas the latter are separated by the summits of the two postero-lateral ambulacra. In consequence, also, of the two antero-lateral ambulacra being rather broader than any of the others, the lateral distance between each pair of ovarian pores is greater than the distance between the frontal pair. The centre of the ovarian disk is occupied by a distinctly marked punctated madreporiform tubercle. The ventral surface is nearly plain, or very slightly convex. The tubercles on it are larger than those of the dorsal. The mouth is eccentric in the direction of the anterior extremity. It is pentagonal, and surrounded by five prominent tubercles, which terminate the inferior interambulacral spaces. These tubercles are curiously granulated in a reticulate fashion. From the mouth radiate ten short petaloid ambulacra, constructed like those of the dorsal surface.

The following table exhibits the comparative dimensions of six specimens, five of which come from the same locality (green sand of Warminster), and one (No. 4) from the junction beds of the green sand and chalk marl at Maiden Bradley, Wiltshire, in which the majority of

specimens exhibit the dimensions of No. 3. Of the six, Nos. 1, 2, and 4 may be regarded as belonging to form β , No. 3 to form α , the most common variety, No. 5 to var. γ , and No. 6 to var. δ . These different forms have really scarcely any claim to the rank of varieties, for every degree of intermediate shape is exhibited by specimens collected in the same localities.

—	1	2	3	4	5	6
Length . . .	1	$0 \frac{11}{12}$	$0 \frac{10}{12}$	$0 \frac{9}{12}$	$0 \frac{8}{12}$	$0 \frac{7}{12}$
Breadth . . .	$0 \frac{10}{12}$	$0 \frac{10}{12}$	$0 \frac{8}{12}$	$0 \frac{6}{12}$	$0 \frac{5}{12}$	$0 \frac{4}{12}$
Height . . .	$0 \frac{8}{12}$	$0 \frac{7}{12}$	$0 \frac{6}{12}$	$0 \frac{6}{12}$	$0 \frac{6}{12}$	$0 \frac{7}{12}$

British Localities and Geological Range.—UPPER GREEN SAND—Warminster, Wiltshire (Survey Collections); Chute Farm, Wiltshire; Hythe, Kent (Morris). Junction beds of UPPER GREEN SAND and CHALK MARL, Maiden Bradley, Wiltshire (Bristow), (Survey Collections).

Foreign Distribution.—Upper green sand of France and Germany. *C. columbarius*, as defined by D'Archiac, is from the Gault of Mans, Coulaines, and Fouras.

DESCRIPTION OF THE PLATE.

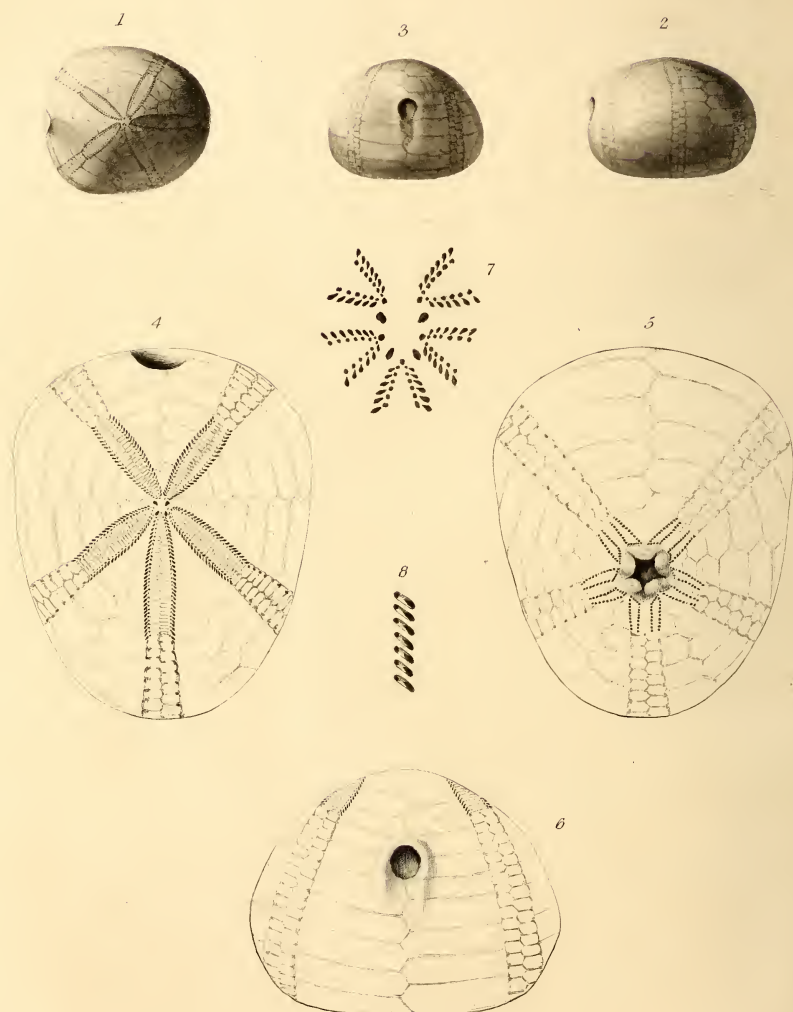
Fig. 1. Specimen of typical form seen from above. Fig. 2. Lateral view. Fig. 3. Posterior view. Fig. 4. Diagram of a specimen of form β , seen from above. Fig. 5. From beneath. Fig. 6. Posterior view. Fig. 7. Diagram of relative positions of ovarian and ocular pores, and summits of the ambulacra. Fig. 8. Arrangement of pores in each ambulacral series.

E. FORBES.

April, 1849.

Geological Survey of the United Kingdom.

NUCLEOLITES
(Cretaceous)



NUCLEOLITES (CATOPYGUS) CARINATUS — *Munster*